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DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service

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National Institute for Occupational Safety and Health
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August 30, 2002
HETA 2002-0114

Mr. Claudio Benedi
Chief, Publications Services Division
United States Office of Personnel Management
1900 East Street N.W.
Room 5H35
Washington, D.C. 20415

Dear Mr. Benedi:

On January 17, 2002, the National Institute for Occupational Safety and Health (NIOSH) received a request from management officials at the United States Office of Personnel Management (OPM) regarding health concerns related to handling and opening irradiated mail at the OPM office building in Washington, D.C. OPM employees in the building expressed concerns about symptoms such as nose bleeds, eye irritation, skin rashes, and upper/lower respiratory irritation.

On January 22, 2002, an opening conference was held with management officials and union representatives (the American Federation of Governmental Employees [AFGE]) where information was obtained on the building and the areas where the employees had concerns about potential exposures. After the opening conference, samples were collected throughout the building where workers handle, process, and open the mail.

A closing conference was held in the OPM building on January 23, 2002, during which preliminary findings and recommendations were discussed. A letter was sent on February 1, 2002, reporting the environmental and medical findings during our site visit.[1] This letter summarizes analytical results of samples collected for formaldehyde, the only analyte not discussed in the earlier letter.

Method

Mail may include products (e.g., paper, photographic film) in which formaldehyde was used in the manufacturing process. Therefore, air samples were collected during this evaluation to assess whether irradiated mail released formaldehyde at concentrations that could cause workers' symptoms. Area air samples were collected on silica gel sorbent tubes (containing a cartridge

coated with 2,4–dinitrophenylhydrazine) at a calibrated flow rate of 0.2 liter per minute (lpm). The tubes were analyzed at Datachem Laboratories, Inc. (Salt Lake City, UT) by high pressure liquid chromatography (HPLC) according to NIOSH Method 2016.[2]

Formaldehyde

Formaldehyde is used in the production of fertilizer, paper, photographic film, plywood, and urea-formaldehyde resins. It is also used as a preservative in some foods and in many household products such as antiseptics, medicines, and cosmetics. Sources of formaldehyde in the environment include smog, cigarettes and other tobacco products, gas cookers and open fireplaces, manufactured wood products and household sources such as fiberglass, permanent press fabrics, and some cleaners. Combustion processes account for the majority of the formaldehyde entering the environment.

Levels of formaldehyde in the environment have been well characterized and will vary depending on the area of the country and whether it is a rural or urban environment. One study found that formaldehyde concentrations measured in the ambient environment ranged from 0.001 to 0.068 parts of formaldehyde per million parts of air (ppm), with an average of 0.0028 ppm. Generally, indoor formaldehyde concentrations are much higher than outdoor concentrations.[3]

Formaldehyde can be absorbed through the lungs or skin. The first symptoms associated with formaldehyde exposure, at concentrations ranging from 0.1 to 5 ppm, are burning of the eyes, tearing, and general irritation of the upper respiratory tract. Individuals vary in their tolerance and susceptibility to acute formaldehyde exposures.[4] Formaldehyde exposure has been identified as a possible causative factor in cancer of the upper respiratory tract in a proportionate mortality study of workers in the garment industry.[5]

NIOSH has classified formaldehyde as a suspected human carcinogen and recommends that exposures be reduced to the lowest feasible concentration. The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) is 0.75 ppm as an 8-hour time weighted average (TWA) and 2.0 ppm as a short term exposure limit (STEL).[6] The American Conference of Governmental Industrial Hygienists' (ACGIH®) has designated formaldehyde to be a suspected human carcinogen and therefore, recommends that worker exposure by all routes should be carefully controlled to levels "as low as possible" below the Threshold Limit Value (TLV®).[7] ACGIH has set a ceiling limit of 0.3 ppm.

Results

Formaldehyde was found at all sampled locations. Measured concentrations ranged from 0.0008 ppm to 0.005 ppm. The highest concentration (0.005 ppm) was found inside a newly remodeled room (i.e., new carpet and paint) in a location where no mail was handled or processed. Formaldehyde sample results are listed in Table 1.

Table 1. Formaldehyde sample locations and results.

Location	Formaldehyde Concentration (ppm)	Sample Volume (liters)
Indoor Background Location (Pendleton Conference Room)	0.002	47.6
Employment Services Room 2455B	0.002	36.8
Employment Services Room 2458 (newly remodeled area) in a location where no mail was handled	0.005	41.2
Court Ordered Benefits Room 2347	0.002	44.6
Retirement Benefits Branch	0.003	31.9
Sub-Basement Temporary Mail Room	0.004	49
Outside OPM Building (at Virginia Avenue Entrance)	0.0008	31.5

Conclusions

The concentrations of formaldehyde could not be directly related to mail processing and were below those which would be associated with acute symptoms.

The following conclusions are based upon NIOSH irradiated mail Health Hazard Evaluations (HHEs).

We believe that it is likely that multiple factors were responsible for the reported symptoms. The added dryness of the mail from the irradiation process and absorptive nature of irradiated mail can lead to skin dryness and irritation following repeated handling. The resultant chapping and irritation of the skin can further progress due to particulate irritation from cellulose particles released by the damaged paper. Individuals with a history of atopy (allergies) may be particularly vulnerable to these effects.

Regarding odors and symptoms of headache, eye irritation, nausea, and nose and throat irritation reported among employees who handle irradiated mail, there is evidence in the medical literature that these types of symptoms can be produced by exposure to VOCs by activating sensory receptors in the nervous system. The activation and amplification of these sensory receptors can occur from exposure to extremely low molecular concentrations of airborne chemicals, concentrations that are difficult or impossible to measure with currently available testing techniques. These odors may have likely played a role in many of the irritant symptoms

experienced by the employees handling irradiated mail. Again, individuals with a history of atopy (allergies) may be particularly vulnerable to the effects of odors. Further, the unusual appearance of irradiated mail would cause individuals to form a negative opinion of the mail and potentially interpret the odors produced by the mail as hazardous. This can result in individuals cognitively amplifying the irritant symptoms, such as headache or nasal irritation, produced by the mail odor and produce symptoms, such as nausea or dizziness, typically unrelated to sensory irritation.

The fact that the conditions and exposures discussed above took place in a climate of heightened awareness and unusual anxiety due to recent terrorist acts may have likely contributed to the reporting of symptoms by employees responsible for handling the mail.

Recommendations

We have no recommendations regarding formaldehyde. The following recommendations are based upon NIOSH irradiated mail HHEs. NIOSH has worked with other government organizations such as the Office of the Attending Physician at the Capital and the General Services Administration (GSA), to offer the following guidelines for handling irradiated mail. The recommendations are provided to address the symptoms reported by employees.

- Employees who experience symptoms they feel are associated with presence in the workplace or a specific work activity (such as handling irradiated mail) should report their symptoms to the employee medical clinic. Continued surveillance of reported symptoms by the clinic may provide useful information concerning the possible work-relatedness of those symptoms.

- If areas are identified by the clinic where there are consistent concerns, an Indoor Environmental Quality (IEQ) investigation should be conducted in these areas to identify any potential sources of contaminants or identify any adjustments that could be made to the heating, ventilating, and air-conditioning (HVAC) system to improve the air quality.

- Because sub-optimal humidity levels have been associated with discomfort and irritation, careful adjustment of humidity levels could be made by someone familiar with the HVAC system.

- No specific personal protective equipment (such as gloves) is recommended for employees. Individuals who choose to wear gloves while handling irradiated mail should first consider using a glove made of a breathable material known as a non-occlusive glove. A non-occlusive glove that could be used is a thin cotton glove (other non-occlusive gloves with gripper pads on the palm and finger tip surfaces are also available). While not recommended, if an occlusive glove is used it should be a non-latex, powder-free glove of an appropriate size (latex gloves are not recommended because of the potential for developing an allergy to latex over time). Occlusive gloves (non-latex, powder-free gloves) should only be worn for short periods of time while handling mail and immediately removed when done to prevent

excessive hand sweating and irritation by the gloves. Cotton glove liners used underneath the non-latex, powder-free gloves can decrease occlusive glove irritation of the hands, and absorb perspiration. If used, gloves should be changed when they are grossly dirty or have perforations in them, and should be removed when eating, drinking, or smoking.

- Employees should avoid touching the mouth, eyes or facial skin when handling mail, even when wearing gloves.

- Excessive hand washing can cause drying of the skin and may lead to increased skin irritation. Mild, lotion-based soaps should be available at all employee wash stations in place of harsh soaps. Hand washing is recommended after handling large amounts of mail, when hands are grossly dirty, after removing occlusive gloves, and before eating, drinking or smoking. A water-based lotion or moisturizer should be applied to the hands after each time hands are washed and several times throughout the day for those persons who may have dry skin.

- Individuals who experience eye or nose dryness or irritation may use over-the-counter saline eye drops or saline nose spray as frequently as they feel necessary to alleviate symptoms.

- Individuals who handle mail should do this in areas that are well ventilated. To ventilate the mail as much as possible, mail should be spread out and not enclosed in a box or drawer. Spreading out the mail can help reduce the odor associated with irradiated mail and may decrease the incidence of headache.

- All information about ongoing changes in mail and mail handling procedures should be shared with employees in a timely manner.

Thank you for your cooperation with this investigation. The previous letter[1] and this letter will serve as the final report for this HHE. For the purpose of informing affected employees, copies of the letters should be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days. If you have any questions, please do not hesitate to contact us at (513) 841-4387, or (513) 841-4589.

Sincerely yours,

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HETA 2002-0114 (closeout)

Keywords: SIC 9199 General Government, Not Elsewhere Classified. Irradiated Mail, Indoor air quality, Indoor environmental quality, nose bleeds, eye irritation, skin rashes, and upper/lower respiratory irritation.